

Application No. 10/532,084
Amendment dated November 12, 2008
Reply to Office Action of August 11, 2008

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REMARKS

Claims 1-3, 5, and 8-20 are pending in this application. In light of the cancellation of claim 4 in a previous Response, claim 5 has been amended to depend on claim 1.

This amendment does not present new matter or raise new issues. In view of the preceding amendment and the following remarks, the applicants respectfully request reconsideration of the instant application.

The Claimed Invention

The invention recited in claims 1-3, 5, and 8-20 lies in the composition of a conductive resin composition including four components: conductive filler (A), urethane-modified epoxy (meth)acrylate (B), (meth)acrylate (C), and other ethylenically unsaturated monomer (D). As noted in the Response dated May 12, 2008, the combination of the claimed components achieves remarkable unexpected improvements in flowability in molding, appearance of the molded article, and flexural strength. (Response of May 12, 2008, p. 12) (citing Specification, p. 30-31) (comparing Examples 1-6, which contained components (B) and (C) to Comparative Examples 1-3, which did not contain components (B) and (C)).

In the Office Action, claims 1-3 and 8-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/055030 to Okumura, et al., in view of U.S. Patent No. 6,251,308 to Butler, evidenced by U.S. Patent No. 7,132,460 to Fujimoto, et al.

The applicants respectfully traverse this rejection on the basis that, given the inherently unpredictable nature of the art, it would not have been obvious to select three components from three separate references to arrive at the claimed invention.

As noted above, the claimed composition includes four specific components:

- 1) a conductive filler (A);
- 2) a urethane-modified epoxy (meth)acrylate (B) obtained by reacting an epoxy (meth)acrylate (b-1) with a polyisocyanate (b-2); the epoxy (meth)acrylate (b-1) being obtained by an addition reaction of an epoxy

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resin having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit and a (meth)acrylic acid; the epoxy (meth)acrylate (b-1) having a hydroxyl value in the range of 100 to 300; the molar ratio of moles of hydroxyl group of the epoxy (meth)acrylate (b-1) to moles of isocyanate group of the polyisocyanate (b-2) being within the range of 1.0/(0.5 to 1.5);

- 3) a (meth)acrylate (C) having a number average molecular weight of 500 to 10,000, which contains 20 to 80% by weight of an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit, and contains no active hydrogen atom; the (meth)acrylate (C) is a reaction product obtained by reacting a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit with a (meth)acrylic acid, or a reaction product obtained by reacting a polyisocyanate having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit with a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit under the conditions that an isocyanate group of the polyisocyanate is in excess of a hydroxyl group of the polyol, with a (meth)acrylate having a hydroxyl group; and
- 4) the other ethylenically unsaturated monomer (D) which is copolymerizable with the urethane-modified epoxy (meth)acrylate (B) and the (meth)acrylate (C).

(Claim 1).

In reaching the obviousness rejection, it was asserted in the Office Action that three references must be combined to disclose the claimed composition. Specifically, it was asserted that the primary reference, **Okumura**, discloses components A and D. In order to arrive at component C, it was asserted that it would have been obvious to react the diisocyanate of **Okumura** with the aromatic polycarbonate diol of the secondary reference, **Fujimoto**, although

- (1) this reference is directed to an entirely different kind of resin from **Okumura**, and
- (2) the polycarbonate diol of **Fujimoto** does not correspond to the urethane acrylate which is one of the polyester polyol used in component (C) (see discussion below).

As for component B, the obviousness rejection turns to yet another secondary reference, **Butler**, although no indication is provided in **Okumura** for combining component (C) with the vinyl ester-series of **Butler**.

This is exactly the kind hindsight obviousness reasoning not allowed by the Federal Circuit

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for unpredictable arts, such as resin composition. *Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358 (Fed. Cir. 2008) (finding that unpredictable arts overcome KSR). In March 2008, the Federal Circuit clarified the application of KSR on unpredictable arts, and explained that it is not enough to “simply retrace[] the path of the inventor with hindsight, discount[] the number and complexity of the alternatives, and conclude[] that the invention . . . [is] obvious.” *Id.* at 1365. At the time of the claimed invention, given the challenges of the inventive process in the inherently unpredictable art of the chemical composition of resins, it would not have been obvious to selectively combine ingredients from three references to arrive at the claimed invention.

In fact, as the Examples show, objective evidence points to the contrary: remarkable unexpected results flowed from the particular combination of the claimed components in terms of flowability in molding, appearance of the molded article, and flexural strength. (Response of May 12, 2008, p. 12) (citing Specification, p. 30-31). Furthermore, recognizing the nonobvious inventiveness of the claimed invention, the EPO and JPO have both granted the corresponding patent applications. Accordingly, in light of *Ortho-McNeil*, the applicants respectfully submit that, in the case of unpredictable arts, such as here, it would not have been obvious to select three components from three references, and discount the number and complexity of the alternatives, to arrive at the claimed resin composition.

For example, with respect to component (C), no motivation exists to combine Okumura and Fujimoto. Okumura is directed to molding resin compositions to be used in forming fuel cells, among others. (Okumura, abstract). As such, the resin of Okumura is formed to achieve specific attributes ideal for conductive molding compounds. For instance, Okumura combines an electroconductive agent and a radical-polymerizable thermosetting resin to deliver characteristics specific to a separator for a fuel cell:

[An] object of the present invention is to provide a separator for a solid polymer-type fuel cell having gas-imperviousness, low electrical resistance, durability

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(especially, resistance to an acid such as resistance to sulfuric acid), and **high mechanical strength**, and a process for producing the separator with ease and effective.

(Okumura, [0007]).

On the contrary, the function of **Fujimoto's** resin is entirely different from that of **Okumura**. **Fujimoto** is directed to an active ray curable composition for coating optical discs. As such, **Fujimoto's** resin is formed with specific components to achieve low volume shrinkage coefficient in polymerization and excellent hardness, but does not at all address electrical conductivity or compensate for the effects of adding a conductive filler:

An object of the invention is to provide an active energy ray curable composition for coating optical disc, capable of forming a cured coating layer (protective layer) showing low volume shrinkage coefficient in polymerization, having excellent transparency, and having excellent hardness, ability to protect a recording layer and mechanical properties, and an optical disc having a cured coating layer obtained by curing this composition.

(**Fujimoto**, col. 2, ll. 32-39). Furthermore, the polycarbonate diol of **Fujimoto** does not correspond to the urethane acrylate which is one of the polyester diols used in component (C).

Conductive molding compositions are not analogous to resin compositions for coating optical discs. Given that **Okumura's** main and most important objectives are gas imperviousness, low electrical resistance (electrical conductivity), resistance to sulfuric acid, and high mechanical strength, a skilled practitioner confronted with the technical problems of improving a conductive molding resin would not be motivated to look to **Fujimoto**, which does not relate to electrical conductivity at all.

In addition, it would not have been obvious to replace the vinyl ester resin in **Okumura** with the urethane-modified vinyl ester resin of **Butler** as the component (B).

The Examiner conceded that **Okumura** does not disclose the claimed urethane-modified epoxy (meth)acrylate, and cited **Butler** instead. (Office Action, p. 4). Specifically, the Examiner asserted that **Butler** discloses a cross-linkable prepolymer such as an unsaturated polyester resin or

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vinyl ester resin (i.e., epoxy (meth)acrylate (b-1)), and a rheological modifier such as polyisocyanates (i.e., polyisocyanate (b-2)). (Office Action, p. 4). In addition, the Examiner pointed out that **Butler** discloses Resin F, which is a urethane-modified vinyl ester resin. (Office Action, p. 4).

Okumura does not disclose that urethane acrylate is used together with vinyl ester resin. While **Okumura** discloses that vinyl ester-series resin is preferable in the radical-polymerizable resins, this description means that vinyl ester should be used as one of the radical-polymerizable resins, rather than urethane acrylate. (**Okumura**, page 4, [0055]). In fact, the Examples of **Okumura** use vinyl ester resins in place of urethane acrylate. However, there are no Examples in which urethane acrylate is used alone or together with other resin. In addition, **Okumura** discloses "[a]s the radical-polymerizable resin . . . for, example, vinyl ester-series resins, unsaturated polyester-series resins, urethane (meth)acrylates, polyester (meth)acrylates and the like. These radical-polymerizable resins can be used singly or in combination." (**Okumura**, [0018]). However, there is no description and suggestion for combining vinyl ester-series resins and urethane (meth)acrylate. That is, **Okumura fails to disclose the combined use of vinyl ester resin and urethane acrylate.**

Additionally, **Butler** does not teach a urethane-modified epoxy (meth)acrylate that is a reaction product of epoxy (meth)acrylate and a polyisocyanate, as recited in claim 1.

In **Butler**, "the molding compositions are generally prepared by adding the resin, monomer initiator, inhibitor, mold release agent, and rheological modifier (if present)." (**Butler**, col. 9, ll. 53-55). While **Butler** discloses Resin F, a urethane-modified vinyl ester resin, as one component in the Examples, the reference does not discuss at all how Resin F is formed, let alone whether it is a reaction product of epoxy (meth)acrylate and a polyisocyanate. (**Butler**, col. 8, ll. 6-8). Furthermore, while **Butler** discloses that the rheological modifier can be a polyisocyanate, the rheological modifier is not disclosed as a reactant in forming the urethane-modified vinyl ester resin.

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(Butler, col. 5, ll. 20-25; col. 9, ll. 53-55). In fact, in the discussion of vinyl ester resins, **Butler does not mention the use of a polyisocyanate at all:**

In general, the vinyl ester resins that can be used are the reaction products of epoxy resins and a monofunctional ethylenically unsaturated carboxylic acid. More specifically, these vinyl ester resins are the reaction product of an epoxy terminated oligomer, for example, an epoxy functionalized bisphenol A with an acrylic acid or methacrylic acid forming acrylic terminal groups on the oligomer.

(Butler, col. 4, 16-22).

In the Office Action, the Examiner asserted the following:

An essential component to the improved molding composition is a rheological modifier, which may act to increase the molecular weight such as by chain extension of the resin prepolymer. Suitable modifiers include polyisocyanates. **It is believed that the foregoing modifiers act chemically by co-reacting into the polymer backbone at carboxy or hydroxyl sites** (Col. 5, line 20-27).

(Office Action, p. 4). However, given that **Butler** does not mention polyisocyanates at all in relation to forming a urethane-modified vinyl ester resin; only mentions polyisocyanates in relation to a rheological modifiers; and, only mentions rheological modifiers as being added to an already-formed urethane-modified vinyl ester resin, **not as a reactant in forming a urethane-modified vinyl ester resin**, **Butler's** disclosure of "[a rheological] modifier . . . co-reacting into the polymer backbone carboxy or hydroxyl sites" does not at all provide the necessary teaching to arrive at the particular urethane-modified epoxy (meth)acrylate (B) recited in claim 1. (**Butler**, col. 5, ll. 25-27).

Accordingly, given the inherently unpredictable nature of the resin composition art, the applicants respectfully submit that it would not have been obvious to combine three references to arrive at the claimed invention, especially in light of the lack of motivation to combine **Okumura** with **Fujimoto**, and **Okumura** with **Butler**. Therefore, the applicants request that this rejection be withdrawn.

In the Office Action, claim 5 was rejected under 35 U.S.C. §103(a) as being unpatentable over **Okumura**, in view of **Butler**, further in view of U.S. Patent No. 5,886,082 to **Numa**.

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In particular, **Numa** was cited for the disclosure of polyether diols, such as alkylene oxide adduct of bisphenol A, polyethylene glycol, polypropylene glycol, and the like. (Office Action, p. 6).

Numa fails to make up for the deficient disclosure of **Okumura** and **Butler**, namely urethane-modified epoxy (meth)acrylate (B), and the use of aromatic polyester diols to obtain (meth)acrylate (C). Therefore, the applicants request that this rejection be withdrawn.

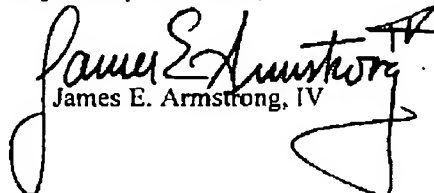
In view of the above amendment, the applicants believe the pending application is in condition for allowance.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 04-1105.

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Respectfully submitted,



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